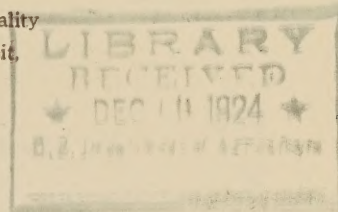


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# THE EXTENSION PATHOLOGIST

"To promote economic crop production, improve the quality of the products, and prevent wastage in storage, transit, and at the market."



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**THE OFFICE OF COOPERATIVE EXTENSION WORK**  
AND  
**BUREAU OF PLANT INDUSTRY**  
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**VOLUME 2.**

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# THE EXTENSION OF THE

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SOUTHERN STATES

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THE EXTENSION PATHOLOGIST

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NOTES ON EXTENSION ACTIVITIES RELATING TO DISEASE  
CONTROL BY SEED TREATMENT

The first number of the Extension Pathologist was issued in November, 1923, the subject for discussion being "Extension Work Relating to Disease Control by Seed Treatment." The reports contained in this issue seemed to be of unusual interest, and requests have frequently been received for further information concerning work which is being done along this line. The following notes dealing with seed disinfection in the case of cereals, potatoes, tobacco, cucumbers, cotton, cabbage, and sorghum are worthy of careful study. They not only contain views with regard to methods of extending certain types of subject matter, but suggest ways in which research and extension workers are cooperating in the development of the farm program for plant-disease control. F. C. M.

CEREALS:                    Seed-Treatment Tests in Oregon

In Oregon copper-carbonate treatment of wheat was adopted on a rather large scale. Where the seed was thoroughly treated excellent results were obtained, although in some cases the stand of grain was so heavy that maximum yields were not obtained. Where the farmers cut down the rate of seeding, good results were obtained. The method will be adopted very much more extensively this season.

Tests conducted at the central station at Corvallis, and at points in the wheat-growing area, including the Sherman County branch station, showed the superiority of seed treated with high-grade copper carbonate over that treated with liquids even more emphatically than in previous years. On the average, better smut control was obtained with copper carbonate than with the copper sulphate treatment. In many cases, the control was equal to that obtained with formaldehyde, and seed or seedling injury was entirely absent.

Several brands of high-grade copper carbonate containing 50 per cent copper, and of 200 mesh fineness, were tested and found to give almost identical results. Practically perfect control of smut was obtained with two ounces, even where the seed of a susceptible variety was smutted as heavily as one part smut to 500 parts wheat. On heavily smutted grain low-grade copper carbonate of different brands running from 10 to 22 per cent copper failed to give anything like as good control as the high-grade brands, even when used in heavier amounts than the standard. With seed smutted lightly, however, (1 to 2,000 or 1 to 3,000 rate) practically the same results were obtained from use of 2 ounces of low-grade copper carbonate, as were obtained when the same amount of high-grade material was used.

A number of mercuries were tested by the dust methods. The best



of these were, in our tests, distinctly inferior to copper carbonate, while some, which have not yet been placed on the market, showed no control whatever.

Furfural was tested with oats by the dipping method, 1 to 400 strength. In no case was there the slightest evidence of smut control. Copper carbonate did not give quite as good smut control with oats as did formaldehyde.

H. P. BARSS.

CEREALS:

Smut-Control Demonstrations in Idaho

During the last three years, extensive smut-control demonstrations have been carried on by the writer and Mr. O. S. Fletcher, county agricultural agent of Latah County, Idaho, in cooperation with various farmers in the county. The primary object of these demonstrations has been to test the relative merits of the copper-carbonate method of seed treatment and various other methods commonly used by the growers of the Palouse region. As we are located in a region where soil infestation by the spores of stinking smut is very severe, methods of seed treatment, which have been successfully used elsewhere, have not always proved successful here.

During the first two years, copper carbonate was applied at the rate of 2 ounces to the bushel. When applied at this rate, copper carbonate did not give as good control as the standard bluestone dip of 1 pound of bluestone and 1 pound of salt to 5 gallons of water. During the fall of 1922, demonstrations were started on 57 farms, using in all 10 different varieties of wheat. In each case the copper carbonate was applied under the direction of either Mr. Fletcher or the writer, while the treatment with which it was compared was applied by the farmer cooperating.

Several different brands of copper carbonate were compared in connection with these tests. In general, it was found that the so-called distended copper carbonate containing less than 50 per cent metallic copper did not give as good control as the pure product containing over 50 per cent when applied at the rate of 2 ounces to the bushel. Tests carried on with spring wheat during both 1923 and 1924 also indicate that it is necessary to use more of the distended copper carbonate than of the pure product in order to obtain satisfactory control.

During the fall of 1923, 66 comparisons of copper carbonate and other treatments were started on 51 farms. The dust was applied in all cases at the rate of 3 ounces to the bushel, and a brand of copper carbonate containing over 50 per cent metallic copper was used in all trials. The same methods of procedure were followed as in previous years. In all comparisons made on any given farm, the same wheat was used for each treatment, and the other conditions were as nearly identical as possible. Smut counts made during the summer of 1924 in these fields gave the fol-



lowing results.

On 22 farms, copper carbonate was compared with the bluestone dip (1 pound of bluestone to 5 gallons of water). On these farms there was an average of 14.66 per cent smutted heads in the plots grown from seed treated with copper carbonate, and an average of 16.37 per cent in those grown from seed treated with bluestone.

Copper carbonate was compared with the bluestone - salt dip (1 pound of bluestone and 1 pound of salt to 5 gallons of water) on 19 farms. These tests resulted in an average of 14.26 per cent smutted heads in the wheat from seed treated with copper carbonate, and 11.09 per cent in that grown from seed treated with bluestone and salt.

Seven comparisons were made between copper carbonate and the formaldehyde dip (1 pint of formaldehyde to 40 gallons of water). Wheat from seed treated with copper carbonate showed 15.55 per cent smut, while the crop which followed formaldehyde treatment developed 13.64 per cent smut.

On 4 farms, copper carbonate was compared with a bluestone dip, consisting of 1 pound of bluestone to 4 gallons of water. The counts on these farms showed 13.32 per cent smut for the copper carbonate and 5 per cent smut for the bluestone.

Miscellaneous treatments, consisting mostly of weak solutions of bluestone or bluestone and lime, were compared with copper carbonate on 22 farms. Copper carbonate showed 9.66 per cent smut, while the miscellaneous treatments averaged 11.56 per cent smut.

Part of the wheat for these demonstrations was treated with a power-driven continuous-treatment machine. The balance was treated with a small barrel churn. In checking over the results of the two methods, it was found that better control was obtained when the treating machine was used.

As a result of these tests, as well as carefully conducted experiments carried on at the Idaho Experiment Station for the last few years, we have concluded that the copper-carbonate method of seed treatment, when properly applied, will give nearly as good control as other treatments in common use in the Palouse region. Furthermore, the treatment has many distinct advantages, which will compensate for any difference there may be in smut control.

It may be of interest to note at this time that the dust treatment has not been effective when tested for the control of oat smut at the Idaho Experiment Station.

CHAS. W. HUNGERFORD.



CEREALS:

Seed Treatment in Washington

The problem

Perhaps in no other section of the world, with the possible exception of Australia, is there so much stinking smut of wheat as is found in eastern Washington. Since the founding of the experiment station, the control of this pest has been a paramount problem. Damages from this plant disease consist of loss in yield, loss by smut explosion in threshing machines and combines, and dockage of the wheat and oats as they go to market.

The loss in yield, due to smut, sometimes amounts to 50 per cent or 60 per cent of the crop. I think a fair average would be about 10 per cent. The loss in smut explosions is due to the fact that, as the smut balls are blown in the combines and stationary machines, a dense cloud of smut dust forms. The high speed of the machinery generates static electricity. Anything that might cause static electricity to jump from one part of the machinery to the other, making a spark, may ignite this smut dust, causing a terrific explosion. The striking of rocks on the cylinder teeth or the striking of matches in the machine may also start this explosion and fire. During the harvest of 1923, about 400 separator fires occurred in eastern Washington and northern Idaho. After grain is threshed, if there is an odor of smut in the grain, there is a dockage of the price. This past year, some of our farmers have suffered a dockage of as high as 2 or 3 cents on a bushel.

Difficulties

Usually seed treatment with some of the standard fungicides will effectively control bunt. However, in Washington we have what is known as a soil infestation, so that, even if the farmer thoroughly treats his wheat, there is still a chance of infection when the wheat is planted in the soil. In Table I, you will note that the average amount of smut for copper carbonate is 7 1/2 per cent, and for bluestone 8.6 per cent. These results are taken in eastern Washington, where we have the soil infestation. The results for wheat, in Table II (tables omitted) were taken in Skagit County, where no particular soil infestation occurs, and you will note that the untreated wheat had 47.6 per cent smut, while the wheat from seed treated with copper carbonate had .9 per cent. It is not uncommon for soil infestation in eastern Washington to be responsible for as much as 30 per cent of the stinking smut.

Methods of Disinfection

The standard methods of seed disinfection for the control of smuts in Washington are the use of formaldehyde and formaldehyde solution, a solution of bluestone, and the copper-carbonate dust. The disadvantages of using formaldehyde and bluestone consist mainly in the large amount of seed injury and the disagreeable work connected with the handling of wet grain in the field. These two objections do not hold for copper carbonate, and since good control is obtained, this chemical is largely re-



placing the old wet treatments.

#### Results with Copper Carbonate

During the season 1920-21 in Franklin County, Wash., 10 acres of wheat were planted with seed treated with copper carbonate. During 1921-22, this treated acreage was increased to 10,000 acres, and during the season of 1922-23, to more than 726,000 acres. During 1923-24, we had over a million and a half acres seeded to wheat treated with copper carbonate. It is to be expected that this acreage will be increased for 1925.

It is an interesting thing to note, that during the harvest of 1924 Walla Walla County, which used more copper carbonate than any other single county in the real wheat belt, had the lowest percentage of smut known to the locality. An adjoining county, where the farmers have not yet used the copper-carbonate method, reported more smut than in any other previous year. Tables I and II give the results of smut counts in Washington for 1924. It seems possible that the smut problem in Washington will be solved by the production of smut-proof varieties of wheat and oats. Already the Markton variety of oats has proved to be smut proof. The new variety of wheat known as Redit is also proving its value by being smut proof and giving a fair yield.

During the harvest of 1924, it was found that some of the wheat hybrids on the State agricultural experiment farm were entirely free from smut and gave promise of good quality in stiffness of straw and superior yields. One particular cross between white Odessa times Hybrid 128 in the fourth generation gave a yield of 50 1/2 bushels per acre, was smut proof, and had a good stiff straw. This is a yield of about 13 bushels more than Hybrid 128 which, at the present time, is our best yielding wheat for Washington conditions.

GEORGE L. ZUNDEL.

#### CEREALS

##### Seed Treatment in Indiana

The treatment of seed in Indiana may be grouped under three headings,- cereals, vegetables, and potatoes.

##### Hot-Water Treatment of Wheat

This spring, the loose smut and stinking smut of wheat were particularly serious, and demands for assistance with the hot-water and copper-carbonate treatments have been correspondingly great.

The hot-water treatment has been going through what might be termed a gradual process of evolution in Indiana. It is now beyond the demonstration stage; the farmers know that the treatment will control smut. This fact has been demonstrated in practically every county of the State.



The evolution of the treatment has been as follows. First, the work was carried out on individual farms, where small amounts of wheat were treated for seed plots by the barrel method at that time. The small seed plot idea seemed to be the most efficient means of developing a volume of smut-free wheat. This wheat was planted at one side of a field. Both mechanical and pathological difficulties were soon apparent. The farmers would not cut these small strips separately, or, if they did, the wheat became mixed, owing to the carelessness of field men during threshing. The other trouble was that the smut reappeared too quickly in this treated wheat, sometimes the next year, owing to the close proximity of smutted fields to the plots planted with treated seed.

These difficulties led to the demand for more extensive treatment and necessitated the development of some more rapid method. The tank and drum method was the result; and in all but 3 of the 20 counties using this apparatus it was stationed at some central point in the county. This necessitated long hauls by the farmers who wanted their wheat treated. Furthermore, the equipment was rather expensive, costing about \$150. Under this arrangement, however, nearby farmers had enough seed wheat treated to plant whole fields.

In this way the idea of community work developed. The plan of treating that has been followed during the past two years is to establish community treating stations. Tanks of some sort are obtained from farmers or rented from a local hardware store. The water is heated by steam from some convenient source. Elevators, creameries, sawmills, threshing engines, or even laundries have furnished such heat. The farmers soak the wheat at home, using burlap sacks containing not more than  $\frac{1}{2}$  bushel. At the station the wheat is treated by hand, but the method is more rapid than by the drum. Each man handles two sacks of wheat in the water, but there is always an extra man who helps put the wheat into the water and take it out. By this method about 5 bushels can be treated per hour per man; and with six or eight men treating at a time, it can be seen that this method is superior to the tank and drum method. Moreover, the apparatus is cheap, and it can be placed anywhere the farmers desire. The cost of the treatment varies from 5 to 8 cents per bushel.

We believe that the most effective means of decreasing smut is to work with those farmers who are producing seed wheat. The growers of certified wheat are urged to treat small amounts each year, so as to maintain a smut-free seed plot from which they get their own seed. The mistake that was made at first in treating any kind of wheat merely for the sake of making a demonstration is being avoided as much as possible.

#### Copper Carbonate Treatment of Wheat

Stinking smut has been serious now for two years, and there has been a very urgent demand for help. The copper-carbonate treatment immediately became popular. All sorts of homemade devices were used for mixing. This method of seed treatment has been one of the easiest to introduce into farm practice. Not many demonstrations have been given, because the farmers can readily use the copper-carbonate method without visual instruction. I have found again the value of an article in farm papers when



a single story in the "Farmers Guide" has shown its effect all over the State.

Hot-Water Treatment of Barley

Barley has been treated for several years, using a similar method to the hot-water treatment of wheat. The seed is soaked at least six hours and then stirred in water at 126° F. for 13 minutes. This treatment has been completely successful and has completely rid one barley-raising locality in Harrison County of both loose and covered smut. Previous to this work, the percentage of smut in the barley ran from 25 to 45 per cent.

CHARLES T. GREGORY.

CEREALS:

The Work in Virginia

About two days ago, we treated 70 bushels of wheat and barley in Botetourt County, Va., and this in one day. We are utilizing canning factories for this work and find the equipment very suitable for our work on this project. We are still in the midst of this work and have been very busy for the last three weeks.

JAMES GOIKIN.

CEREALS:

Experiments on Seed Treatment at Arlington Farm

Bunt of Wheat

We used purple straw wheat in our experiments and confined our treatments largely to dust methods. The only solution used was the standard copper sulphate lime which has been employed successfully in the past for the control of bunt. We used copper carbonate and a number of the organic mercury compounds. As in previous years, copper carbonate proved to be the most satisfactory of these treatments for the control of bunt. We used pure basic copper carbonate and the dilute form which contains about 18 to 20 per cent metallic copper. No bunt occurred in any of the plots of wheat grown from seed treated with either of these copper-carbonate dusts. The yields were considerably better than those obtained from plots sown with seed treated by the copper sulphate-lime method. Some of the organic mercury compounds gave good control of bunt, and the yields were as good as those from wheat grown from seed treated with copper carbonate. The wheat in the check plots grown from untreated seed had an average of more than 70 per cent bunt.

We do not have the problem of soil infestation in this locality. This no doubt accounts for the fact that our control is much more perfect than that obtained by investigators working in the Pacific Coast regions, where soil infestation is a big problem.



### Loose Smut of Wheat

I am very much interested in Mr. Gregory's report concerning the control of loose smut of wheat by the hot-water seed treatment. According to the results obtained by Mr. Tapke in his experimental work in the Office of Cereal Investigations, we would not be justified in recommending the hot-water seed treatment only under such circumstances as mentioned by Mr. Gregory, namely, the treating of sufficient seed to establish smut-free areas for the growing of seed wheat. Mr. Tapke's records show that the modified hot-water treatment invariably causes seed injury. It not only kills part of the seed, but weakens the germinative power of seeds which are not killed. This is true especially when the seed coats are injured. This makes it all the more important that a cooperative plan be followed in treating all the infested seed sown within given localities for the purpose of establishing disease-free areas, where clean seed may be grown for sowing without treatment.

### Smuts of Barley

In our experiments for the control of barley smuts, we have continued to use formaldehyde in comparison with a number of organic mercury compounds. We have found in the past that neither copper carbonate nor the other dusts tried are effective in the control of smuts of barley. We also found in our past experiments that some of the mercury compounds are even more effective than either formaldehyde or hot water in the control of both loose and covered smut of barley. These materials have to be used in liquid form, however, to obtain satisfactory results. They do not cause the seed injury which often is caused by formaldehyde and hot water. We have used only about six varieties of barley in our experiments, but in all of these varieties loose smut is controlled as effectively by formaldehyde and organic mercury compounds as by hot water. In most cases barley grown from seed treated with the organic mercury compounds have given much more satisfactory yields than have the same varieties grown from seed either untreated or treated with formaldehyde or hot water. This is perhaps due to the fact that no injury follows the treatment with the mercury compounds.

There is a possibility, however, that the loose smut would not be controlled in all varieties of barley by the surface-treatment method. There seems to be a tendency for different varieties to behave differently toward seed treatment. Certain local factors might also influence the results. For the varieties of barley which we have used in our experiments, we do not feel that it is at all necessary to use the tedious hot-water method of seed treatment for the control of either of the smuts.

### Oat Smuts

The results of the control of oat smuts in our experiments on Arlington Farm were not at all satisfactory again this season, due to the fact that very little smut developed in oats grown from untreated seed.



even though the seed was smutted heavily to begin with and was obtained in so far as possible, from a seed supply which was naturally infested. Our results in the past, however, have checked with those reported by Mr. Hungerford of the Idaho station and others in that copper carbonate has not proved to be satisfactory for control of smut. So far the results which we have been able to obtain indicate that formaldehyde is the most effective treatment. We have applied formaldehyde by soaking the seed for 10 to 30 minutes in a solution of 1 pint in 40 gallons of water.

W. H. TISDALE.

POTATOES:

Progress Made in Kansas

Potato-Seed Treatment

On starting the work in this State, method demonstrations were first given. These were followed with test plots in the various communities, in which potato growing is of considerable importance. A tour was next made of the test plots during the growing season, and records of yield were taken at harvest time. In the fall of the year, at the potato show, the results of these tests were outlined by the grower who cooperated in carrying on the work.

The work has been conducted in a similar manner each year. However, in the past year or two, we have emphasized what might be called equipment and accuracy demonstrations. These, of course, you will realize are of considerable importance to the success of the work. Figure 1 gives some idea of the growth of the practice among farmers of the Kaw Valley.

A survey of the State board of agriculture reports for the five-year period, 1915 to 1919, a weighted average yield of 97.7 bushels per acre, and for the period 1920 to 1924, a weighted average yield of 119.9 bushels per acre. It is evident that increase of yield has accompanied the growth of seed treatment.

E. A. STOKDYK.

POTATOES:

Hot Formaldehyde in Missouri

Seed treatment of potatoes in Missouri is proving to be a most effective means for control of rhizoctonia which is our most serious potato disease. Last year, on demonstration fields the average increase resulting from seed treatment was 18 1/3 bushels per acre, and this year the increase promises to be higher.

Both the corrosive-sublimate method and the hot-formaldehyde method are now in use. Corrosive sublimate is recommended for the grower planting on a small scale, and those who live wherever facilities for the hot-formaldehyde treatment are not available. Some analyses made in March, 1924, would indicate that the mercury content of a solution, made up and used under farm conditions, even when renewed as commonly recommended, is subject to such wide variations as to make its effectiveness uncertain. This probably accounts for the widely varying results obtained from its use.



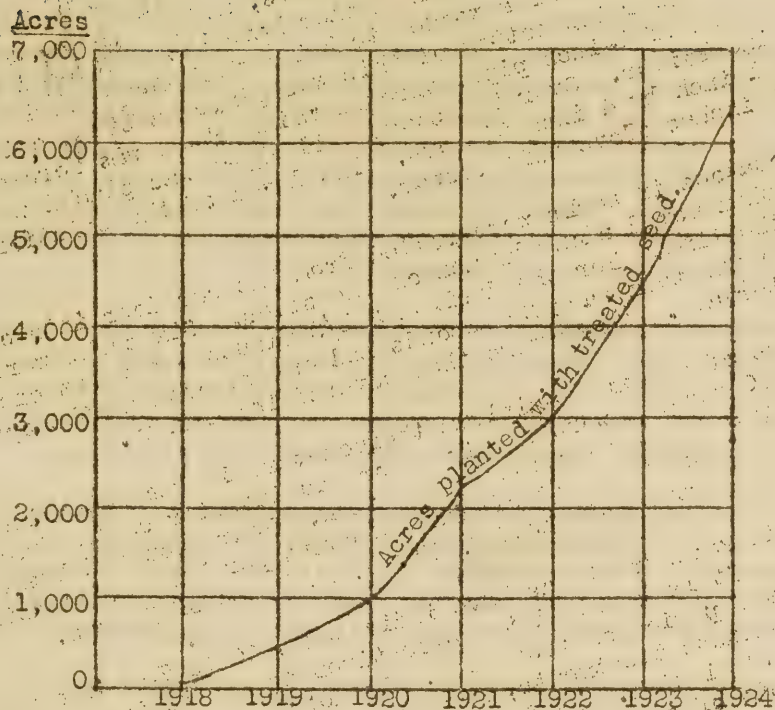
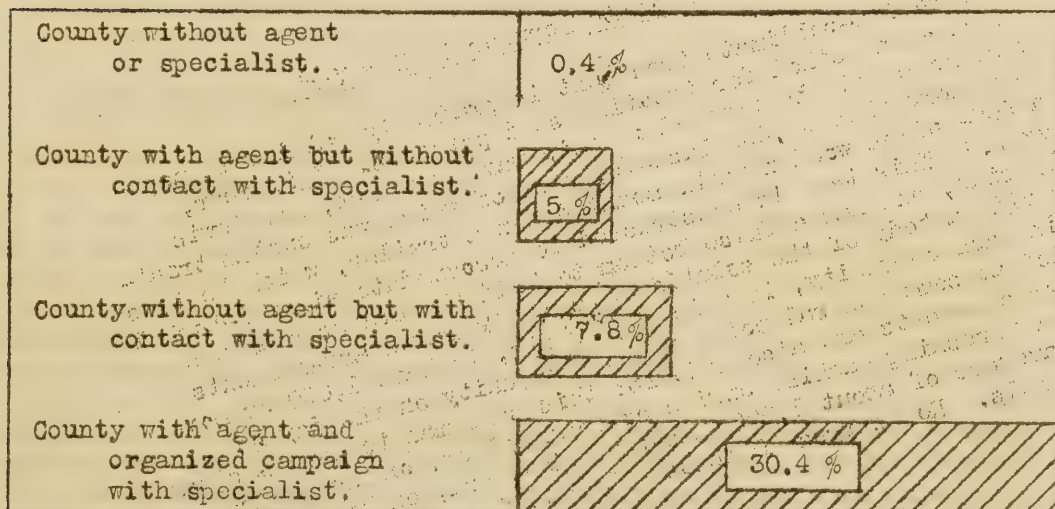


Fig. 1. - Growth of seed-potato treatment in Kaw Valley, Kans., 1918-1924.



Percentage of total acreage planted with treated seed potatoes.

Fig. 2. - Value of extension organization in promoting potato seed-treatment activities, as shown by results in Kansas.



Hot formaldehyde (1 pint to 15 gallons at 122° F.) has been used by the experiment station for two years, and, in 1924, several communities desiring to treat seed in this manner have been assisted in so doing. Equipment consisted of a wooden tank 2  $\frac{1}{2}$  feet deep and 4 feet wide by 12 feet long. Near the bottom of this was placed a steam coil, consisting of 7 lengths of 1-inch pipe, through which steam was forced from a threshing-engine boiler. Over the steam coil there was placed a slatted runway made of 1 inch by 4 inch timbers. The level of the solution was kept at about 18 inches above this runway.

Potatoes in sacks were rolled from the car door into one end of the tank and then moved along by men on the sides. Six sacks were kept in the tank all the time. For the desired 2  $\frac{1}{2}$  minute treatment one sack was rolled into the tank each 25 seconds and one removed at the opposite end at like intervals. Sacks were then covered for 1 hour.

By use of a maximum-minimum thermometer, it was determined that approximately 30 seconds were required for the interior of the bag to reach the temperature of the solution in the tank. Four thousand bushels were treated in one tank at a cost of about 3 cents per bushel. A method similar to this was previously used by Mr. R. P. White of Kansas.

Counts in various fields have indicated a 60 to 75 per cent control by this method. It is believed the effectiveness can be increased by lengthening of the period of treatment. No detrimental effects have been observed from 4-minute treatments, nor, at the experiment station, from treatment up to 10 minutes. By determining the best length of treatment and with the advent of smaller and simpler machines for treating, the hot-formaldehyde method will no doubt become more satisfactory for Missouri conditions.

E. M. PAGE.

#### POTATOES:

#### Hot Corrosive Sublimate Popular in New York

The hot corrosive-sublimate treatment is gradually gaining in popularity in New York as a method for treating seed potatoes. This year, 30,000 bushels or more will be treated in this way. One man, Mr. Lewis Toan, has treated more than 20,000 bushels, most of which was custom treating. He has a 500-gallon wooden tank, mounted on a trailer, which he tows behind a "flivver." This tank is constructed to accommodate eight 1-bushel crates, side by side, and has a false bottom to hold the crates near the surface and provide a body of the solution below. He makes arrangements with some man in each community, in which he treats, to have 1,000 or more bushels assembled at some central point in the community on the day he treats there. Arrangements are also made for this same man to have a steam boiler, usually a threshing machine engine or road roller, on hand. Mr. Toan treated an average of about 1,270 bushels a day, and, on his best day, treated 2,540 bushels. He charges 10 cents a bushel for treating.



The hot-corrosive-sublimate method would be impracticable, if the solution had to be discarded after a few treatments, as it takes considerable time to heat the water to start with. Consequently, some method of testing the solution in order to keep it up to standard strength is employed by those who use the hot treatment. The potassium-iodide test is the one commonly used. This test is also being employed by many persons using the cold treatment with sublimate. When the test is used and the strength of the solution kept up to standard, 1 pound of corrosive sublimate will treat, on the average, 75 to 80 bushels of tubers by the hot method and 60 to 70 bushels by the cold method. Of course, the actual amount required varies with the containers used and the extent to which the tubers are free from dirt.

M. F. BARRUS.

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CABBAGE: Hot-Water Treatment of Cabbage Seed Used in Indiana

This year seed of the Indiana yellows-resistant cabbage was treated by the hot-water method developed by Dr. J. C. Walker. This seed was thoroughly infested with blackleg and black rot. It was used in all parts of the State, and in no case was there evidence of injury by the treatment. The diseases were completely controlled.

C. T. GREGORY.

CABBAGE: Cabbage-Seed Treatment in New York

Probably half of the cabbage seed used in New York is treated before planting. Nearly all this treating is done with corrosive sublimate (1-1,000 for 30 minutes). A few men treat with hot water (122° F. for 30 minutes). Two years ago, the hot-water method was recommended to farmers, but there was so much injury that the recommendation had to be withdrawn. It has been found that new seed may be heated to 122° F. for 30 minutes with very little loss of germination. Seed that is a year old will often germinate only about 70 per cent, and still older seed may not grow at all after such drastic treatment.

In this State there are two firms that grow cabbage seed on a large scale, and there are about a dozen farmers who grow a few hundred pounds of seed for local distribution. In addition, much seed is imported. One of the larger firms has a pathologist who is endeavoring to grow seed free from blackleg. The individual farmers who grow seed in small quantities either have none of this disease in their seed or treat all their cabbage seed with hot water before selling it. Of course, several kinds of disease may be found in the imported seed. For this reason, some of the larger distributors have asked for and received cultural tests of their stock. The extension specialist has plated out more than 20,000 seeds on agar in testing for the blackleg organism. There is probably a very large error connected with such a procedure, although the testing has proved very satisfactory.



Taking into consideration all the above precautions, a farmer may buy seed free from Phoma lingam, especially, if he obtains home-grown seed as more are doing each year. Then, by treating with corrosive sublimate for black rot, he is reasonably sure to be free from seed-borne troubles.

In addition to seed treatment, some of the men are following the recommendation given in Geneva bulletin 513. Instead of screening the seed to prevent maggot infestation, they are applying the corrosive sublimate solution to the seedlings. The results have been very satisfactory, not only in giving sturdier plants than those under cheesecloth, but also in either reducing or eliminating wire stem, blackleg, black rot, and clubroot.

C. CHUPP.

CABBAGE: Hot Water Used in Wisconsin

The demonstrations on cabbage-seed treatment at Racine this year were very satisfactory. Twenty-five per cent of blackleg had been common with several farmers during recent years; but this season, following seed treatment by the hot-water method devised by Dr. J. C. Walker, we could find only a trace of blackleg. The seed treatment, however, is not infallible in the control of blackleg, because one farmer planted treated seed in a location where infection from blackleg was carried over in the soil from a previously diseased crop. Plants taken from this seed bed will not yield more than one-tenth of a crop.

R. E. VAUGHAN.

COTTON: Sulphuric-Acid Treatment in South Carolina

Some years ago we found that sulphuric-acid treatment of cotton seed is not only very effective against angular leaf spot, but also reduces materially infection in the case of cotton anthracnose. Since the sulphuric-acid treatment hastens germination and gives more vigorous seedlings which grow more rapidly, we have come to recommend it for general practice. This year many of our farmers delinted the cotton seed with sulphuric acid before planting; and, so far as we know, they were practically all pleased with the results. Careful experiments, conducted on our own experiment-station fields, show that seed treated in this way sends up plants from 5 to 7 days earlier than the untreated seed. Plats treated in this way have also produced a higher yield than those grown from untreated seed. Last year the difference in favor of the treated seed was about 150 pounds of seed cotton per acre.

H. W. BARRE.

CUCUMBER:

Cucumber-Seed Treatment Recommended by the  
United States Department of Agriculture

Since it has been repeatedly demonstrated that the angular leaf-spot disease of cucumbers can be easily and effectually controlled by seed treatment combined with crop rotation, spraying is no longer recommended as a primary means for the control of this disease alone. In cases where the disease is introduced into fields planted with treated seed from nearby fields where treatment was not used or when this precautionary seed treatment has been neglected, spraying with 4-4-50 Bordeaux mixture, if begun in the early stages of attack and repeated at frequent intervals, will hold the disease in check.

Angular leaf spot is so widespread, occurring from southern Florida to Michigan, from California to Connecticut, and, furthermore, in the principal sections where the bulk of the cucumber seed is grown, that it is more than likely to be present on any seed purchased. Seed treatment as a precautionary measure against the presence of the germs of angular leaf spot is, therefore, well worth while.

One of the large commercial pickling companies that was interested in the original experimental work and preliminary tests has tested the treatment on a large scale and found it so effective that for several years it has annually treated 18,000 to 20,000 pounds of seed before distributing it to its growers. A large wholesale seed grower has also offered, for a small additional charge to cover actual cost of the work involved, to treat seed purchased.

The treatment recommended involves immersion of the seed for 5 minutes in a 1-1,000 solution of mercuric chloride followed by a thorough washing for 15 minutes, in running water, if possible, and subsequent drying by spreading the seed out in a thin layer in the shade. The seed should preferably be placed in loosely woven sacks for treatment, the sacks being filled not more than one-half or two-thirds full to allow for swelling of the seed.

W. W. GILBERT.

CUCUMBER:

Seed Treatment and Spray Successful in Florida

Demonstrations for the control of the cucumber diseases, downy mildew and angular leaf spot, were conducted in several counties. Due to climatic conditions, unfavorable markets, and other factors beyond our control the demonstrations were greatly interfered with. In many cases spraying stopped, and the fields were abandoned before any fruit had been picked.

Extension effort was concentrated in Levy County, where 1,900 acres were planted. Before planting started, stress was placed on seed disinfection for the control of angular leaf spot. Practically all seed for the first and second plantings were treated with corrosive sublimate, 1 part to 1,000 parts of water, for a period of 10 minutes. Three tons of seed were so treated. Continued heavy rains and unseasonably cold



weather were unfavorable for germination, and practically 100 per cent of the first and second plantings failed to come up. The growers became over-anxious to get rot seed in the ground; and consequently, practically none of the third and fourth plantings was treated. Angular leaf spot was so severe and so widespread in Levy County on the spring crop, that it became the limiting factor in the production of a profitable crop.

Henry Coulter of Bronson furnished a very clear-cut demonstration on the value of seed disinfection for the control of leaf spot. All of his field of 5 acres, with the exception of four rows on the east side, was planted with disinfected seed. The four rows of plants grown from untreated seed showed angular leaf-spot infection on the first set of true leaves. The plants made a very poor and unthrifty growth due to increasing infection, and no fruit was ever picked from these rows. The balance of the field resulting from the treated seed showed no angular leaf-spot infection until after the vines had started to run, when they became infected from the untreated rows and adjoining fields. The disease was held in check by systematic sprayings with 4-4-50 Bordeaux mixture, and a good crop of fruit was harvested.

Comparisons between sprayed, dusted, and untreated fields immediately adjacent to one another were numerous. One example will suffice, as comparative results varied but little throughout the county. Messieurs Smith, Blitch, Lewis, and Messer, all of Williston, had plantings adjacent to each other. Mr. Smith sprayed twice. Mr. Messer sprayed once and dusted once. Mr. Lewis dusted twice, and Mr. Blitch neither sprayed nor dusted. These were all late plantings, and the disease present necessitating control measures was downy mildew. Mr. Blitch's field, which was untreated, was a total loss. Mr. Smith's vines, sprayed twice, were green and thrifty 15 days after Mr. Blitch's were dead. Mr. Messer's plants, sprayed once and dusted once, were green 10 days longer than Lewis', which had been dusted twice. Mr. Lewis' plants remained green only a few days longer than Mr. Blitch's untreated plants.

The sprayed fields produced fruit on an average of 10 days longer than the dusted fields and 15 days longer than the untreated.

Comparison of the quality and grades of fruit produced on the sprayed, dusted, and untreated fields brought out the following facts: Cucumbers from sprayed vines were green in color and free from bacterial rot, following bacterial spot, which is caused by the angular leaf-spot organism. Forty per cent was fancy, 55 per cent choice, and 5 per cent culls. The dusted fruit did not hold its color as well and had a moderate amount of bacterial rot. Thirty per cent was fancy, 50 per cent choice, and 20 per cent culls. The untreated fruit was of poor color, and bacterial rot was severe. It graded 20 per cent fancy, 40 per cent choice, and 40 per cent culls.

The spray used in these demonstrations was Bordeaux mixture 4-4-50, applied with power sprayer and hand-barrel pump equipped with 3-foot extension rods and 45 degree disc nozzles. The best results were obtained when the spray used per acre averaged 100 gallons for the first, 125-150 for the second, and 200-225 for the third, with a spray pressure of 100-125 pounds.

Dusting was done with various types of hand dusters, using copper lime dust of a 20-80 strength. The amounts of dust used were very variable, ranging from 5-50 pounds per acre per application.

### Conclusion

Disinfecting cucumber seed with corrosive sublimate, one part to 1,000 parts of water for 10 minutes, for the control of angular leaf spot may be expected to prevent infection from this disease until infection takes place from outside sources.

When angular leaf spot and downy mildew are present and the vines are systematically sprayed with 4-4-50 Bordeaux, a picking season of from 10 to 15 days longer than unsprayed fields may be expected.

The best control was obtained where the spray used averaged 100 gallons for the first spraying, 125-150 for the second, and 200-225 gallons for the third, with a spray pressure not exceeding 100 to 125 pounds. If the spray pressure does not exceed 125 pounds and the material is properly applied, no spray injury will result, and the sprayed fields will produce fruit as early as the unsprayed fields.

JOHN R. SPRINGER.

### SORGHUM:

#### Sorghum Seed Treated in Kansas

This year we attempted sorghum seed-treatment demonstrations in the western part of the State, putting them more or less on a semi-experimental basis, especially, in the case of the copper-carbonate seed treatment. Meetings were called by the county agents on the farms of local cooperators, and a "treating bee" was held at each place. The men brought their seed to the meeting where instructions were given for treatment, and the agent and specialist assisted in treating this seed. At the same time we treated a small amount of seed with copper carbonate, being careful to leave a part of the seed untreated as a check. This was then compared with formaldehyde treatment. The "treating-bees" worked very successfully, and a considerable acreage was treated in these counties.

As an experiment in one county, we tried the "local leaders" plan. A leader from each community was invited in to the county agent's office on a set date. Specialists met with them, gave a demonstration on the method of seed treatment, and answered any questions asked by these local cooperators. Then we set a date for a seed-treatment day in the county, and these local men were to have "treating bees" of their own, unassisted by the agent or specialist. This summer we took occasion to check up on the county in comparison with another in which the agent and specialist assisted at the "treating bee." As far as can be determined, the local-leader proposition was almost a failure. The local cooperators, in some cases, failed to give notice of the meeting, in other instances told the



people who came with their seed that they could just as well do it at home and advised them not to bother with bringing it there, and in some cases where "bees" were held, the local leaders failed to give correct directions. In comparison with this, the counties in which the "treating bees" were held in cooperation with the agent were very successful.

Although this is only one year's results with an attempt to carry on the work through local leaders, I believe it gives us some idea of what happens, and I am of the opinion that the men will not work readily in this sort of an organization. They appreciate direct contact with the agent at meetings and use this contact not only for the subject in hand, but also for other purposes and interests.

E. A. STOKDYK.

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TOBACCO:

Word from Kentucky

In regard to seed-treatment work in Kentucky, I can state that seed treatment for control of potato diseases is being pushed along with the seed-certification work, and appears to be giving control of scab and rhizoctonia. There is a small amount of work being done on treatment of wheat and barley ~~and~~ for control of loose smut, but nothing worth mentioning. We have, however, done some work the past two years on treatment of tobacco seed for the control of the leaf-spot diseases, angular leaf spot and wildfire, which will be of some interest to the extension pathologists. This work has been conducted through county agents who have assisted the growers in treating seed. Some of the treatment has also been done at the experiment station, the treated seed being sent out to the cooperating growers. The treatment has consisted of soaking the seed for 15 minutes in a solution of 1-1,000 mercury bichloride and then washing in clean water. In all cases growers have been warned to take all possible sanitary precautions, and these precautions have been outlined to them in detail. Without exception, the results during the past year were negative so far as control of angular leaf spot was concerned. Wildfire was not found in any of the beds planted from treated seed. Neither was it present, however, so far as we know, in the fields from which the seed was taken. The above results were likewise obtained in our own seed beds at the experiment station, where seed treatment was ineffective and where all possible sanitary precautions were taken. The only evidence that we had of real control of angular leaf spot was in a group of small beds planted from seed raised in the greenhouse or from seed removed from a single apparently healthy pod. Our tentative conclusions from the results of these tests are that absolutely disease-free seed must be used and that the commonly recommended seed treatment can not be relied upon to eliminate the disease from the seed.

W. D. VALLEAU.

SWEET POTATOES:      The Work in Mississippi

The regular bichloride of mercury treatment, as advocated by Dr. Harter and his associates, is used by sweet potato growers in Mississippi. The State plant board, our organization that is charged with the responsibility of combatting insect pests and plant diseases and enforcing plant quarantines, has perhaps more to do with this sweet potato seed treatment than any other organization. The board has about thirty-five inspectors stationed in different parts of the State; and these men inspect the seed potatoes, and later the vine crop, which the grower may have set aside for seed purposes.

You will note in the copy of our permit requirements relating to the sending of sweet potato plants into Mississippi by shippers, that all of the seed stock must be inspected by their inspectors and hand culled and treated with bichloride of mercury, as indicated above. The requirements for the out-of-state growers also apply to Mississippi growers.

I really believe that the sweet-potato inspection service and seed-treatment work, as conducted by the State plant board, is making great progress in controlling and eradicating blackrot and stem rot. With our rather large field force, we are able to reach the plant growers and make the regular field inspections for stem rot during July and August, and during the winter months, to render valuable service to the grower in the matter of storage-house disinfection and seed treatment at bedding time.

Our county agents, as well as our plant-board inspectors, have rendered valuable service for several years to the watermelon growers by using the bichloride seed treatment as a preventive for anthracnose.

D. C. NEAL.

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NEWS NOTES

North Dakota:      Reaching the Grower in North Dakota

The copper-carbonate treatment has been used here and there in the State by county agents but is still not extensively used. Our farmers have treated with formaldehyde so long that this method is known everywhere.

There is need at present for spread of information on the control of loose smut of wheat, of which we have had a great deal in certain varieties during the past two years.



We have a very efficient news service, handled through the publications department of the college, whereby we can get out any information we wish and get it out quickly. This, with the daily correspondence, constitutes our chief method of reaching the grower. During the winter months, I had a series of articles published on the control of ergot and another on the control of blackleg of potatoes. During the spring, timely articles on identification and severity of diseases are written.- (From a letter written October 14.)

W. WENIGER.

#### Wyoming: Certified Seed in Wyoming

Forty-eight men, living in five counties in Wyoming, applied for inspection to produce certified seed potatoes this year. This handful of men is carrying the burden of establishing a reputation for Wyoming-grown seed and of placing the seed-potato business on a firm foundation.

Four years ago, when the work was started, hundreds of applications were received by growers from all sections of the State, because there was no fee, and because both irrigated and dry land seed were certified. Last year a fee of 50 cents per acre for 5 or more acres was attached, and only dry land grown potatoes were inspected, so a fewer number of growers applied. Some of these men had poor seed and others were poor farmers, so many were rejected in 1923. This means that almost every field inspected this year will doubtless pass the final bin inspection.

Last year (1923) was a season of heavy rainfall and apparently conducive to the development of the virus diseases. Constant and careful roguing left our seed stocks fairly free from such diseases, so that, this year, fusarium, rhizoctonia, and scab are the prevailing troubles. The inspector has given sufficient time to each grower during the past two seasons to enable him to become familiar with the diseases present in their various forms. This has helped to bring about the fine spirit for proper production and square dealing which exists among our growers.

Seed certification in Wyoming is still under the extension service; and, since we have neither a plant pathologist nor a horticulturist, the three inspections are made by the extension agronomist. This arrangement is not satisfactory, and a change in the work is anticipated.

Dry-land grown Triumphs and Cobblers are being certified this year. Our rules permit irrigated potatoes grown at an altitude of 6,000 feet or over to be certified, but no applications on such stock were received. All growers of certified seed treat their stock with corrosive sublimate. Good cellars, several being run on a community basis, are in use in the certified-seed sections. A few of the best growers are practicing hill selection in an effort to produce disease-free strains.

The certified seed potato game in Wyoming is small, but prosperous, and a good-quality product is put out.

ROY O. WESTLEY.



Minnesota: Potato Late Blight

We have had quite a serious outbreak of late blight in the north-eastern part of Minnesota. This is the first serious outbreak since 1915, and it is causing much concern to shippers.- (From a letter written October 27.)

R. C. ROSE.

EXTENSION PATHOLOGISTS TO MEET IN DECEMBER

The afternoon of Tuesday, December 30, has been set apart for our third annual conference on extension work in plant pathology. At this time the extension pathologists and others attending the winter meeting of the American Phytopathological Society, in Washington, will have an opportunity to meet and exchange views concerning ways of bringing plant-disease control measures into more common use.

Coming as it does in midwinter, before many have completed a program for the next season, this meeting should be most profitable. It is perhaps the best chance of the year to consider plans for 1925 in the light of past experience of workers in other States.

Although this will be an informal round-table conference on extension methods, the committee in charge of the program has thought it best to announce a subject which would be of general interest to men in different parts of the country. Since practically all States are concerned with extending the practice of seed disinfection in the case of one or more crops, this phase of the work has been selected as a framework on which to build the discussions.

Of course, discussions at this meeting will not be limited to the subject of seed treatment. In case you have some matter you will wish to bring up for discussion at this time, please communicate with Dr. R. J. Haskell, Secretary-Treasurer, American Phytopathological Society, Bureau of Plant Industry, Washington, D. C., so that arrangements can be made with the chairman to make the best use of the time available.

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EXTENSION LITERATURE

Since our last issue the following literature has reached this office from the States.

Illinois:

Holbert, James R., Burlison, W. L., Koehler, B., Woodworth, C. M., and Dungan, G. H., Corn root, stalk, and ear-rot diseases, and their control through seed selection and breeding. Univ. of Ill. Agr. Exp. Sta., Bul. 255 (In coop. with U. S. Dept. of Agr.); 478 p. illus. August, 1924.



Maryland:

Appleman, C. O., Potato sprouts as an index of seed value.  
Univ. of Md. Agr. Exp. Sta. Bul. 265; 258 p. illus.  
May, 1924.

Jehle, R. A., and Potts, S. F., Dusting and spraying of cantaloupes.  
Univ. of Md., Agr. Exp. Sta. Bul. 263; 10 p. illus.  
April, 1924.

Jehle, R. A., and Cory, E. N., Spraying for control of diseases and  
insects of the apple. Univ. of Md., Agr. Exp. Sta., Bul. 262;  
9 p. illus. March, 1924.

Cory, E. N., and Potts, S. F., The control of truck-crop pests by  
dusting. Univ. of Md., Agr. Exp. Sta. Bul. 261; 34 p. illus.  
February, 1924.

News notes, extension articles, or suggestions with regard to subjects  
that might be profitably discussed in this news sheet should be addressed to:

Fred C. Meier,  
Extension Pathologist,  
United States Department of Agriculture,  
Washington, D. C.